Claims

1. Metering valve for use as the metering valve of an aerosol container for dispensing medicament comprising

a valve body defining a metering chamber;

said metering chamber having an inlet and an outlet, said inlet permitting flow of aerosol from said container to the metering chamber and said outlet permitting dispensing of aerosol from the metering chamber;

the inlet having an inlet valve reversibly actuable from an open to a closed position; and

the outlet having an outlet valve reversibly actuable from a dispensing to a non-dispensing position, said outlet valve comprising an outlet valve seat and an outlet valve poppet in biasable contact therewith, the outlet valve being closed when the metering valve is at rest; and

an outlet valve mover for moving the outlet valve poppet out of contact with the valve seat, thereby enabling dispensing of the aerosol without requiring movement of any other dispensing member relative to the valve body.

2. Metering valve according to claim 1, wherein said inlet valve comprises an inlet valve seat and an inlet valve poppet in biasable contact therewith.

3. Metering valve according to either of claims 1 or 2, wherein the inlet valve is closed when the metering valve is at rest.

4. Metering valve according to any of claims 1 to 3, wherein the inlet valve and the outlet valve are independently operable.

PG3671 – PCT filing

5. Metering valve according to any of claims 1 to 4, wherein any valve poppet comprises an incompressible material and any valve seat comprises a compressible material.

6. Metering valve according to any of claims 1 to 4, wherein any valve poppet comprises a compressible material and any valve seat comprises an incompressible material.

7. Metering valve according to any of claims 2 to 6, additionally comprising an inlet valve mover for moving the inlet valve poppet out of contact with the inlet valve seat.

8. Metering valve according to any of claims 1 to 7, wherein said outlet valve mover and said inlet valve mover are independently operable.

9. Metering valve according to either of claims 7 or 8, wherein either or both of said inlet valve mover or said outlet valve mover is mechanically actuable.

10. Metering valve according to either of claims 7 or 8, wherein either or both of the inlet valve mover or the outlet valve mover is electrically actuable.

11. Metering valve according to claim 10, wherein either or both of the inlet valve mover or the outlet valve mover comprises a multi-component strip or wire which is deformable in response to electrical current flow.

12. Metering valve according to claim 11, wherein said multi-component strip or wire comprises multiple layers of different metals.

13. Metering valve according to claim 12, wherein the multi-component strip comprises a bimetallic strip.

14. Metering valve according to either of claims 11 or 12, wherein the multi

component strip comprises at least one piezoelectric or piezoresistive material.

15. Metering valve according to claim 11, wherein said multi-component wire comprises a nickel-titanium alloy.

16. Metering valve according to either of claims 7 or 8, wherein either or both of the inlet valve mover or the outlet valve mover is magnetically actuable.

17. Metering valve according to claim 16, wherein either or both of the inlet valve mover or the outlet valve mover comprises magnetic material or material which is magnetically inductive.

18. Metering valve according to either of claims 7 or 8, wherein either or both of the inlet valve mover or the outlet valve mover is pneumatically actuable.

19. Metering valve according to either of claims 7 or 8, wherein either or both of the inlet valve mover or the outlet valve mover is hydraulically actuable.

20. Metering valve according to claim 18, wherein either or both of the inlet valve mover or the outlet valve mover comprises a fluid-filled bag or tube capable of transferring hydraulic force.

21. Metering valve according to any of claims 1 to 20, wherein the outlet valve poppet has a form selected from the group consisting of a ball, a mushroom, a cone, a disc and a plug.

22. Metering valve according to any of claims 2 to 21, wherein the inlet valve poppet has a form selected from the group consisting of a ball, a mushroom, a cone, a disc and a plug.

23. Metering valve according to any of claims 1 to 22, wherein said valve body additionally defines a sampling chamber and the inlet permits flow from the sampling chamber to the metering chamber.

24. Metering chamber according to any of claims 1 to 23, wherein the metering chamber has a fixed volume.

25 Metering valve according to any of claims 1 to 23, wherein the metering chamber has a variable metering volume.

26. Aerosol container comprising a metering valve according to any of claims 1 to 25.

27. Aerosol container according to claim 26, wherein the valve body of the metering valve is not movable relative to the container.

28. Aerosol container according to either of claims 26 or 27 comprising a suspension of a medicament in a propellant.

29. Aerosol container according to claim 28, wherein, said propellant comprises liquefied HFA134a, HFA-227 or carbon dioxide.

30. Aerosol container according to either of claims 28 or 29, wherein the medicament is selected from the group consisting of albuterol, salmeterol, fluticasone propionate, beclomethasone dipropionate, salts or solvates thereof and any mixtures thereof.

31. Aerosol container according to either of claims 28 or 29 comprising a compressed gas, preferably compressed air.

32. Inhalation device for dispensing medicament to a patient comprising

a housing;

an aerosol container, locatable within said housing, said aerosol container comprising a metering valve according to any of claims 1 to 25; and

an outlet valve trigger for triggering the movement of the outlet valve poppet out of contact with the outlet valve seat.

33. Inhalation device according to claim 32, wherein the aerosol container comprises a metering valve according to any of claims 2 to 25, additionally comprising an inlet valve trigger for triggering the movement of the inlet valve poppet out of contact with the inlet valve seat.

34. Inhalation device according to either of claims 32 or 33, wherein either or both of said outlet valve trigger or said inlet valve trigger is triggerable in response to the breath of a patient.

35. Inhalation device according to claim 34, wherein either or both of the outlet valve trigger or the inlet valve trigger is triggerable in response to the inward breath of a patient.

36. Inhalation device according to claim 34, wherein either or both of the outlet valve trigger or the inlet valve trigger is triggerable at a trigger point which is coupled to the end of the exhalation part of a patient's breath cycle.

37. Inhalation device according to any of claims 34 to 36, wherein either or both of the outlet valve trigger or the inlet valve trigger communicates with a sensor which senses the breath of a patient.

38. Inhalation device according to claim 37, wherein said sensor comprises a breath-movable element which is movable in response to the breath of a patient.

39. Inhalation device according to claim 38, wherein said breath-movable element is selected from the group consisting of a vane, a sail, a piston and an impeller.

40. Inhalation device according to claim 37, wherein said sensor comprises a pressure sensor for sensing the pressure profile associated with the breath of a patient.

41. Inhalation device according to claim 37, wherein said sensor comprises an airflow sensor for sensing the airflow profile associated with the breath of a patient.

42. Inhalation device according to claim 37, wherein said sensor comprises a temperature sensor for sensing the temperature profile associated with the breath of a patient.

43. Inhalation device according to claim 37, wherein said sensor comprises a moisture sensor for sensing the moisture profile associated with the breath of a patient.

44. Inhalation device according to claim 37, wherein said sensor comprises a gas sensor for sensing the oxygen or carbon dioxide profile associated with the breath of a patient.

45. Inhalation device according to claim 37, wherein said sensor comprises a piezoelectric or piezoresistive element.

46. Inhalation device according to any of claims 32 to 45, wherein the outlet valve trigger and the inlet valve trigger are independently triggerable.

47. Inhalation device according to any of claims 32 to 45, wherein the outlet valve trigger and the inlet valve trigger are triggerable in a coupled fashion.

48. Inhalation device according to any of claims 32 to 47, wherein either or both of the outlet valve trigger or the inlet valve trigger is a mechanical trigger.

49. Inhalation device according to claim 48, wherein said mechanical trigger comprises a lever mechanism.

50. Inhalation device according to claim 48, wherein said mechanical trigger comprises a torque transfer mechanism.

51. Inhalation device according to any of claims 32 to 47, wherein either or both of the outlet valve trigger or the inlet valve trigger comprises a multi-component strip which is deformable in response to electrical current flow.

52. Inhalation device according to claim 51, wherein said multi-component strip comprises multiple layers of different metals.

53. Inhalation device according to claim 52, wherein said multi-component strip comprises a bimetallic strip.

54. Inhalation device according to either of claims 51 or 52, wherein said multi-component strip comprises at least one piezoelectric or piezoresistive material.

55. Inhalation device according to any of claims 32 to 47, wherein either or both of the outlet valve trigger or the inlet valve trigger is a magnetic trigger.

56. Inhalation device according to claim 55, wherein the outlet valve trigger interacts magnetically with the outlet valve poppet and/or the inlet valve trigger interacts magnetically with the inlet valve poppet.

57. Inhalation device according to claim 55, wherein the outlet valve trigger interacts magnetically with a outlet shuttle contacting the outlet valve poppet and/ or the inlet valve trigger interacts magnetically with a inlet shuttle contacting the inlet valve poppet.

58. Inhalation device according to claim 57, wherein the outlet shuttle and/or inlet shuttle comprises magnetic material.

59. Inhalation device according to either of claims 57 or 58, wherein the outlet shuttle comprises material which is magnetically inductive and the outlet valve trigger comprises an inductive element capable of inducing magnetism therein and/or the inlet shuttle comprises material which is magnetically inductive and the inlet valve trigger comprises an inductive element capable of inducing magnetism therein.

60. Inhalation device according to any of claims 32 to 47, wherein either or both of the outlet valve trigger or the inlet valve trigger is a pneumatic trigger.

61. Inhalation device according to any of claims 32 to 47, wherein either or both of the outlet valve trigger or the inlet valve trigger is a hydraulic trigger.

62. Inhalation device according to claim 61, wherein the hydraulic trigger comprises a fluid-filled bag or tube capable of transferring hydraulic force.

63. Use of an inhalation device according to any of claims 32 to 62 for the delivery of inhalable medicament to a patient.